

Proposed Remedial Action Plan

UXO 18, Cayo La Chiva
Atlantic Fleet Weapons Training Area — Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico
July 2016

1. Introduction

This **Proposed Plan** identifies the rationale and preferred remedial alternative for UXO 18, Cayo La Chiva Island, located at the Former Vieques Naval Training Range (VNTR) in Vieques, Puerto Rico. UXO 18 is also known as Operable Unit (OU) 28 in the Comprehensive Environmental Response, Compensation, and Liability Act Information System (CERCLIS), which is a database maintained by the **U.S. Environmental Protection Agency (EPA)** to track the progress at hazardous waste sites. The Proposed Plan summarizes this OU's history, the results of previous environmental investigations, and the preferred remedial alternative, and it solicits and facilitates public review of and comment on the **preferred alternative**.

This document is issued by the U.S. Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC) Atlantic Division, and EPA Region 2, in consultation with the **Puerto Rico Environmental Quality Board (PREQB)** and the **Puerto Rico Department of Natural and Environmental Resources (PRDNER)**. The Proposed Plan fulfills the public participation requirements in Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)** and in Section 300.430(f)(2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**.

UXO 18 comprises the entire island of Cayo La Chiva, which is located south of the Eastern Maneuver Area (EMA). The only documented military training activity on the island was along the northern

Mark Your Calendar for the Public Comment Period

July 11 – August 25, 2016



Submit Written Comments

The Navy and EPA will accept written comments on the Proposed Plan during the public comment period. To submit comments or obtain further information, please refer to the insert page.

Attend the Public Meeting

August 2, 2016 at 6:00 – 7:00 p.m.

Punta Mulas Lighthouse

Route #200, Morropo Street

Isabel Segunda, Vieques, PR



The Navy will hold a public meeting to present and discuss the preferred remedial alternative. Verbal and written comments will also be accepted at this meeting.

Location of Administrative Record File

Online at: <http://www.navfac.navy.mil/vieques>

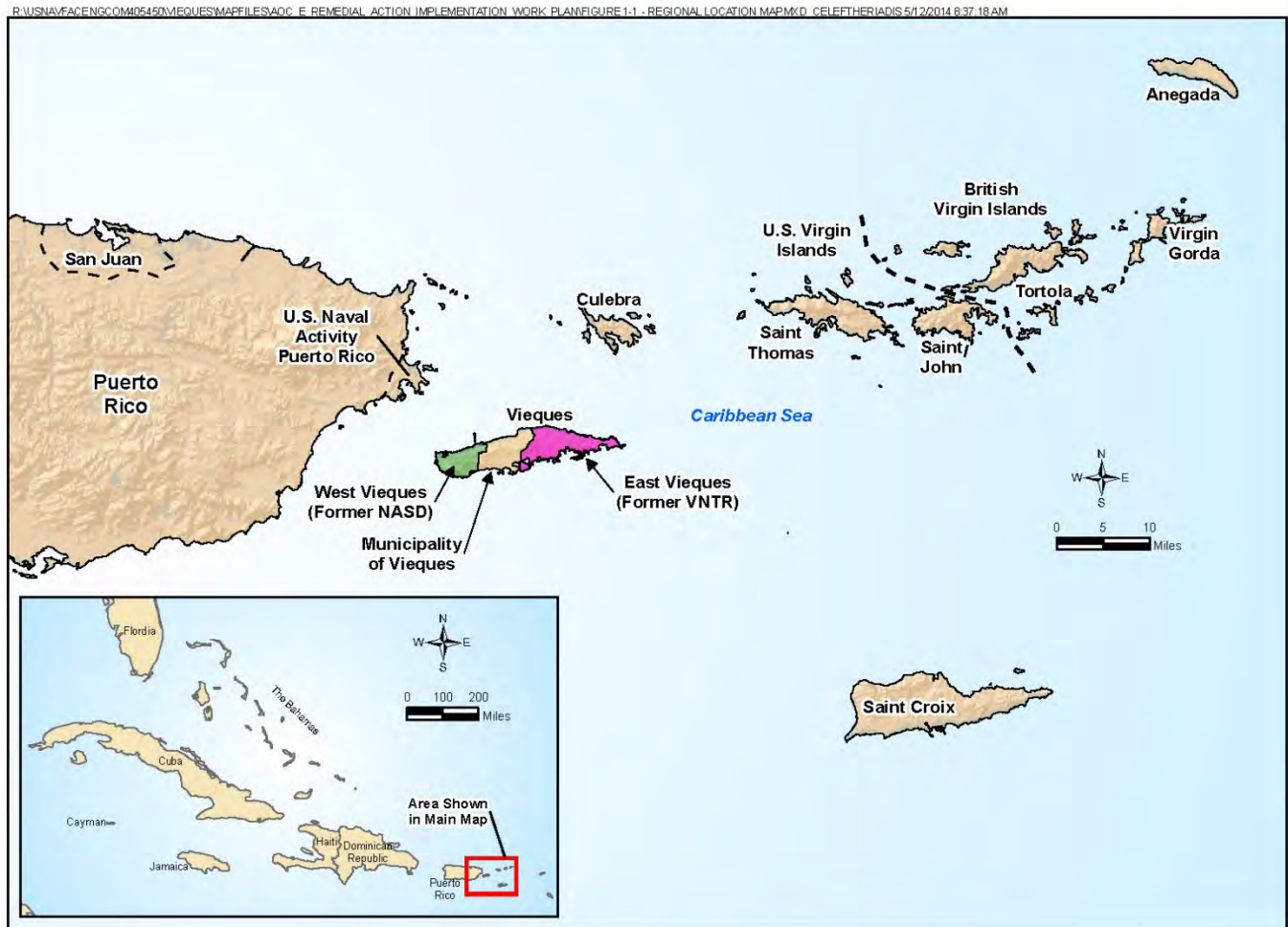
portion where a 0.50-caliber machine gun nest fired blank rounds during simulated amphibious landings at Playa La Chiva in 1950. However, during site investigation activities, several **munitions and explosives of concern (MEC)** were identified both on the island and in the near shore waters; the MEC located offshore are being addressed separately as part of UXO 16. Additionally, **munitions debris (MD)** (smoke canisters) were found on the island.

Based on this information, the current and future anticipated land use as a recreational area and the results of the **Remedial Investigation (RI)** at the site, the preferred alternative for UXO 18 is Limited MEC Removal, **Land Use Controls (LUCs)**, and MEC Inspection. The Navy and EPA, in consultation with PRDNER and PREQB, will make the final decision on the remedial approach for UXO 18 after reviewing and considering all information submitted during the 45-day **public comment period**. If warranted based on public comments and/or new information, the preferred alternative set forth in this document may be

modified or an alternate remedy may be considered. Therefore, it is important to the remedy selection process that the public provide input on not only the proposed remedy but also the other alternatives considered.

This Proposed Plan summarizes information that can be found in greater detail in the **RI/Feasibility Study (FS)** Report (CH2M HILL, 2015), and other documents contained in the **Administrative Record** for UXO 18. A glossary of key terms used in this document is attached; these key terms are identified in bold print the first time they appear.

Figure 1 – Regional Location Map



2. Site Background

2.1 Facility Description and History

Vieques is located in the Caribbean Sea approximately 7 miles southeast of the eastern tip of the island of Puerto Rico (Figure 1). Other than the main island of Puerto Rico, Vieques is the largest island of the Commonwealth. It is approximately 20

miles long and 4.5 miles wide, and it has an area of approximately 33,088 acres (51 square miles).

The Navy purchased portions of Vieques in the early 1940s to conduct activities related to military training. Operations within the former Naval Ammunition Support Detachment (NASD; western one-third of Vieques) consisted mainly of ammunition loading and storage, vehicle and facility maintenance, and some training. Operations within the former VNTR (eastern

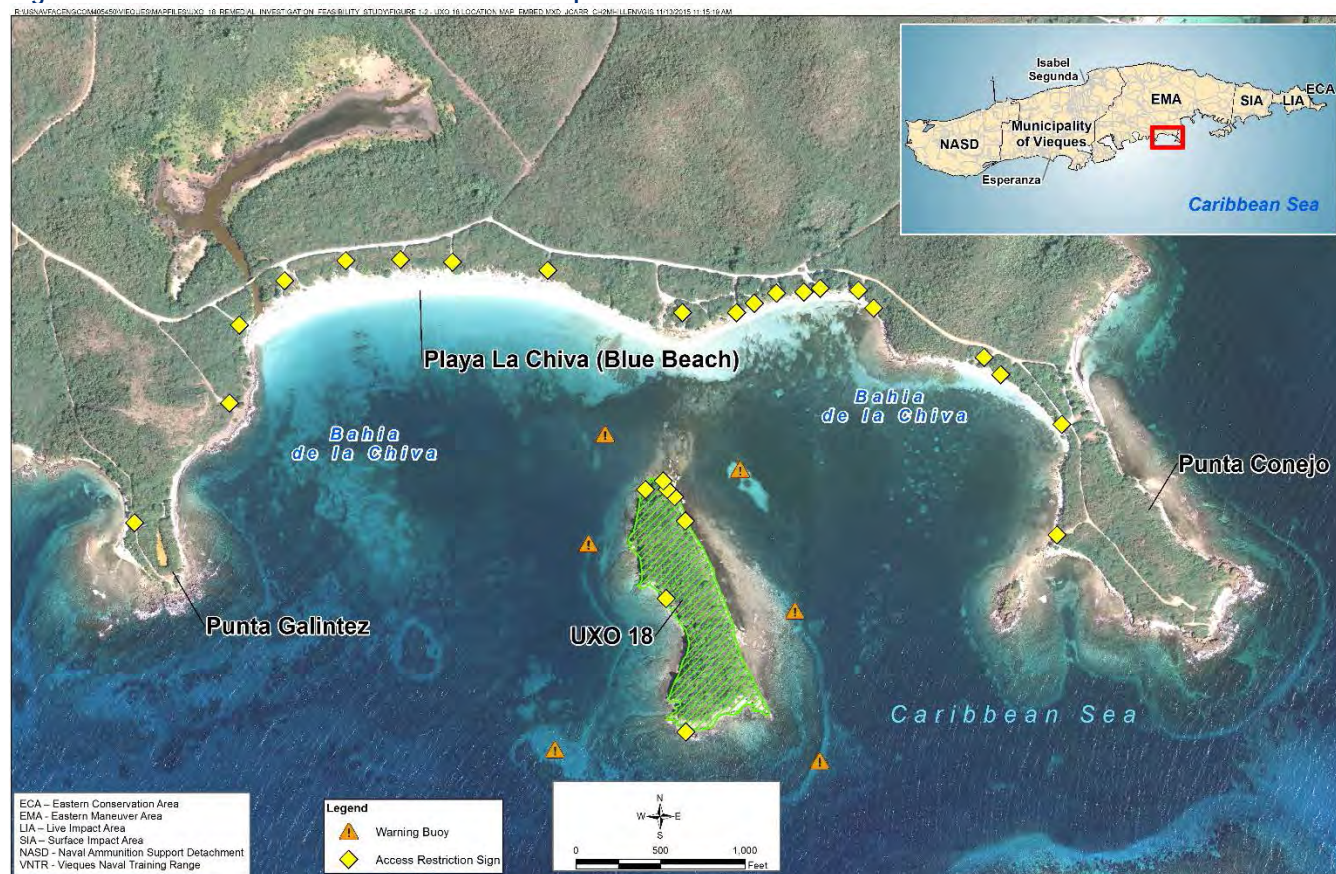
one-half of Vieques) comprised various aspects of naval gunfire training, including air-to-ground ordnance delivery and amphibious landings, as well as housing the main base of operations for these activities at Camp García. The former VNTR is approximately 14,600 acres and comprises the Eastern Maneuver Area (EMA), Surface Impact Area (SIA), Live Impact Area (LIA), and Eastern Conservation Area (ECA) (Figure 2). The Navy ceased training exercises at the former VNTR on April 30, 2003, in accordance with the Presidential Directive to the Secretary of Defense dated January 30, 2000, when the land was transferred to the **Department of the Interior (DOI)**, to be managed by the **U.S. Fish and Wildlife Service (USFWS)** as a National Wildlife Refuge. On February 11, 2005, the Atlantic Fleet Weapons Training Area – Vieques (also known as AFWTA-Vieques) was added to the **National Priorities List (NPL)**, which required all subsequent environmental restoration activities for Navy Installation Restoration (IR) sites on Vieques to be conducted under CERCLA. On September 7, 2007, the Navy, DOI, EPA, and PREQB finalized a Federal Facility Agreement (FFA) that establishes the procedural

framework and schedule for implementing the CERCLA activities for Vieques. The DOI is directed to protect and conserve the transferred land as a wildlife refuge, and the Navy retains the primary responsibility under the FFA for conducting the environmental investigations and clean-up of the property, as warranted. Several small islands around the perimeter of Vieques, including Cayo La Chiva (UXO 18), that were or may have been used for military training activities are owned by the Commonwealth of Puerto Rico.

2.2 Site Description

UXO 18 consists of the entire island of Cayo La Chiva (approximately 12 acres in size), which is located several hundred yards south of Playa La Chiva (Blue Beach) along the southern edge of Vieques within the former VNTR (Figure 2). Several MEC and MD were recovered on the surface of Cayo La Chiva during the Remedial Investigation. As a result, public access to the island is currently not allowed, as indicated by signs along the northern perimeter of the island (accessible portion of the island), by signs at the adjacent Blue Beach access areas, by warning buoys surrounding the island, and by landscape features (natural dense vegetation and steep rock cliffs).

Figure 2 – Former VNTR and UXO 18 Location Map



Cayo La Chiva is owned by the Commonwealth of Puerto Rico and recreational use is intended for the island. There is currently no public access allowed or **groundwater** use within UXO 18. Because of the presence of high cliffs and dense native vegetation, the practical route of access to UXO 18 is limited to the northern portion of the island where narrow sandy beaches are present.

2.3 Summary of Previous Investigations

Environmental investigations relevant to UXO 18 have been conducted since 2006, and specifically at UXO 18 since 2011. The following subsections summarize the purpose, scope, and results of environmental investigations and interim actions completed to date.

2.4 Background Investigation (2006)

A Background Investigation (CH2M HILL, 2007) was conducted in 2006 for the eastern portion of Vieques to develop a set of background values for inorganic constituents in soil for comparison to soil data to be collected during future investigations. This Background Investigation included the same soil type as encountered in Cayo La Chiva.

2.5 Adjacent UXO 16 Investigation (2010)

An investigation in the adjacent UXO 16 (underwater study area) was performed in 2010 to inspect for underwater MEC on, or protruding from, the sediment. Several munitions were identified just west and south of Cayo La Chiva (UXO 18) and a **Non-Time-Critical Removal Action (NTCRA)** is planned to address these items.

2.6 Biological Assessment (2011)

The Biological Assessment (CH2M HILL, 2011) was conducted in 2011 to determine if any federally listed threatened or endangered plant or animal species were present on the island. None were observed. No MEC were identified during this investigation.

2.7 Remedial Investigation (2011 and 2013)

An RI (CH2M HILL, 2015) was conducted to assess the nature and extent of MEC and environmental **media** contamination and to assess potential risks to human health and the environment at UXO 18. There were no **unacceptable risks** to human health or the environment posed by constituent concentrations in site media, so no action is required for environmental media. However, a feasibility study was warranted to address potential explosive hazards associated with the possible presence of MEC present on the island.

2.8 Warning Buoy and Sign Installation (2012)

The temporary warning signs on UXO 18 were replaced with seven more-permanent signs (Figure 2) installed along the northern, western, and southern portions of the island (where there is the highest probability for trespasser activity) that state “No Trespassing. Restricted Area/Authorized Personnel Only. No Entry Permitted to Beaches and Land Areas.” Additionally, six buoys (Figure 2) were installed around the island that say “No Anchor, Explosives” to warn kayakers, boaters, and snorkelers.

2.9 Feasibility Study (2015)

The FS (CH2M HILL, 2015) analyzed remedial alternatives to address the potential presence of MEC at UXO 18, in accordance with EPA guidance. A more detailed description of the FS is presented in Section 7 of this Proposed Plan.

2.10 Feasibility Study Addendum (2016)

The FS Addendum (CH2M HILL, 2016) provides further clarification of the costs and associated assumptions used to evaluate the remedial alternatives that include MEC removal.

3. Site Characteristics

3.1 Physical Characteristics

Cayo La Chiva is a rocky island isolated from the Vieques coastline, located several hundred yards south of Blue Beach. The topography ranges from ocean level at the perimeter (0 feet above mean sea level [ft msl]) to above 35 ft msl in the central portion of the island. The majority of the western and southern portions of the island consist of steep, nearly vertical rock slopes rising more than 30 feet above the bay. The northern portion and very northeastern tip of the island consists of a narrow strand of sandy beach that extends to a very shallow seagrass bed within the bay. Along the eastern side, a very thin strip of sand lies immediately adjacent to the steep rock slope. No surface water features are present within UXO 18.

UXO 18 is heavily vegetated, with the dominant vegetation being a dry scrub forest with occasional isolated stands of taller secondary growth forest. A thin range of mangrove forest exists along the eastern and northern coasts of the island.

The geology of Cayo La Chiva is characterized as weathered limestone, either near or exposed at the ground surface. In some areas, thin layers (generally less than one foot thick) of sandy loam soil overlay the weathered bedrock. Only the northern portion of the

island is sandy. Groundwater within UXO 18 occurs within the bedrock and is saline due to the thin veneer of soil, small size of the island, and the proximity to the ocean.

3.2 Nature and Extent of Contamination

Five MEC (5-inch rockets) were discovered at four locations and were destroyed through controlled detonation on the island. Three MD (smoke canisters) were recovered and removed for processing and disposal.

Soil samples were collected and analyzed for explosives, inorganic constituents, and hexachloroethane (a semi-volatile organic compound [SVOC] potentially associated with smoke canisters) during the RI to determine if munitions-related contamination had impacted the environmental media. Neither explosives

nor hexachloroethane were detected in site soil. Only one inorganic constituent (thallium) was detected in surface soil above a screening criterion (**soil screening level [SSL]**). The SSL is a conservative screening criterion designed to evaluate the potential for chemicals to leach from soil to groundwater above safe drinking water levels. Thallium was detected in only one soil sample and as thallium is not associated with 5-inch rockets or smoke canisters, it is likely that thallium is attributable to natural conditions.

All other detected inorganic constituents were present at concentrations below **background concentrations**. This information further supports that thallium, as well as all other inorganic concentrations detected at UXO 18, are attributable to natural conditions.

Figure 3 – UXO 18 Site Conceptual Model

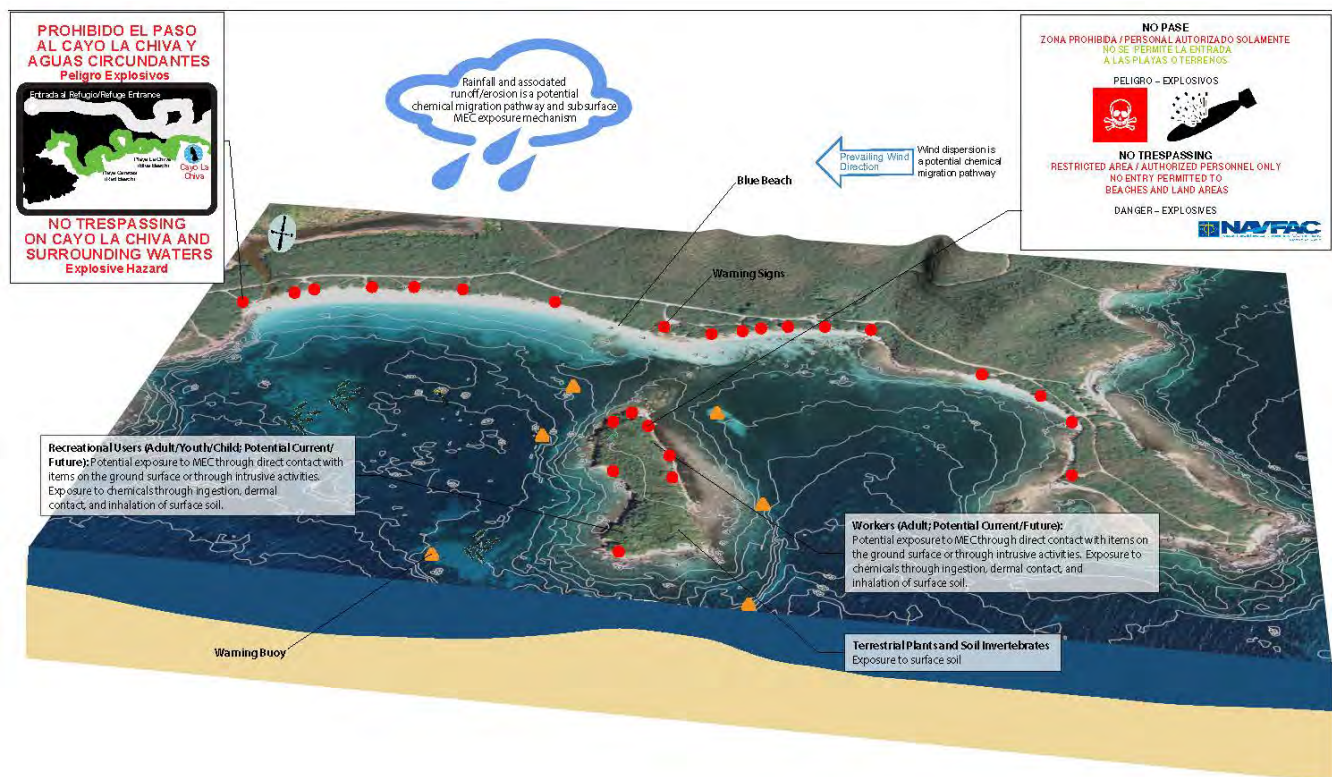


Figure 3-1
Conceptual Site Model
UXO 18 Remedial Investigation/Feasibility Study
Former Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

ES1 2001 0013 01500DC Cayo La Chiva MEC 01 11 4 3 1 5 100g 01

CH2M HILL

4. Summary of Site Risks

A summary of the Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) conducted for UXO 18 during the RI/FS is included in the following subsections and in Table 1. The complete HHRA and ERA are provided in the RI/FS Report, which is available in the Administrative Record File.

Table 1 – UXO 18 Risk Assessment Results

Current/Future Demographic	Human Health Risk
Trespasser/Recreational Adult	ELCR = 1×10^{-6} and HI = 0.05 Acceptable
Trespasser/Recreational Youth	ELCR = 9×10^{-7} and HI = 0.09 Acceptable
Trespasser/Recreational Child	ELCR = 3×10^{-6} and HI = 0.4 Acceptable
Worker	ELCR = 4×10^{-7} and HI = 0.003 Acceptable
ELCR – excess lifetime cancer risk HI – hazard index Unacceptable ELCR = $>1 \times 10^{-4}$ Unacceptable HI = >1	
Media	Ecological Risk
	All Receptors
Soil	Acceptable

4.1 Human Health Risk Assessment

The HHRA was conducted to evaluate potential human health risks associated with exposure to chemicals detected in soil at UXO 18. Maximum detected concentrations of chemicals were compared to risk-based screening levels, and **chemicals of potential concern (COPCs)** would have been identified based on exceedances of these screening levels. Since there were no exceedances of risk-based screening levels, no COPCs were identified at the site.

Health risks are based on an estimate of the potential carcinogenic risk and the potential **non-cancer hazard**, which is expressed as a **hazard index (HI)**. Exposure scenarios evaluated for site soil comprised current trespassers and future recreational users (adults, youths, and children) and workers, since these groups are likely to have the highest potential exposures based on the intended future land use of the island. Potential exposure pathways comprised ingestion, dermal contact, and/or inhalation of chemicals in soil.

No unacceptable risks were identified for potential human **receptors**; in other words, risk estimates were below threshold values. Table 1 provides the risk and hazard for the four demographics analyzed that potentially will be engaged in recreational use of, or maintenance work on, the island.

What is Human Health Risk and How is it Calculated?

A Human Health Risk Assessment (HHRA) estimates the likelihood of health problems occurring if no cleanup action were taken at a site. This is also referred to as “baseline risk.” HHRA is conducted using a stepped process (as outlined in Navy and EPA HHRA policy and guidance). To estimate baseline risk at a site, the Navy performs the following four-step process:

Step 1: Data Collection and Evaluation

Step 2: Exposure Assessment

Step 3: Toxicity Assessment

Step 4: Risk Characterization

During Data Collection and Evaluation (**Step 1**), the concentrations of chemicals detected at a site are evaluated, including:

- Identifying and evaluating area(s) where site-related chemicals may be found (source areas) and at what concentrations.
- Evaluating potential movement (transport) of chemicals in the environment.
- Comparing site concentrations to risk-based screening levels to determine which chemicals may pose the greatest threat to human health (called “chemicals of potential concern” [COPCs]). Constituents are not excluded from the risk assessment process if they are within the range of background.

In **Step 2**, the Exposure Assessment, potential exposures to the COPCs identified in Step 1 are evaluated. This step includes:

- Identifying possible exposure media (for example, soil, air, groundwater, surface water, and/or sediment).
- Evaluating if/how people may be exposed (exposure pathways).
- Evaluating routes of exposure (for example, ingestion).

- Identifying the concentrations of COPCs to which people might be exposed.
- Identifying the potential frequency and length of exposure.
- Calculating a “reasonable maximum exposure” (RME) dose that portrays the highest level of human exposure that could reasonably be expected to occur.

In the Toxicity Assessment (**Step 3**), both cancer and non-cancer toxicity values are identified for oral, dermal, and inhalation exposures to the COPCs. The toxicity values are identified using the hierarchy of toxicity value sources approved by EPA.

Step 4 is Risk Characterization, where the information developed in Steps 1-3 is used to estimate potential risk to people. The following approach is used:

- Two types of risk are considered: **cancer risk** and non-cancer hazard.
- The likelihood of developing cancer as a result of site exposure is expressed as an upper-bound probability; for example, a “1 in 10,000 chance.” In other words, for every 10,000 people that might be exposed under the conditions identified in Step 2, one additional case of cancer may occur as a result of site exposure. Unacceptable risk exists when the ELCR of 1×10^{-4} is exceeded.
- For non-cancer health effects, a “hazard index” (HI) is calculated. The HI represents the ratio between the “reference dose,” which is the dose at which no adverse health effects are expected to occur, and the RME dose for a person contacting COPCs at the site. The key concept here is that a “threshold level” (measured as a HI of 1) exists below which no non-cancer health effects are expected to occur.
- The potential risks from the individual COPCs and exposure pathways are summed and a total site risk is calculated for each receptor.
- The uncertainties associated with the risk estimates are presented and their effects on the conclusions of the HHRA are discussed.

4.2 Ecological Risk Assessment

The RI/FS ERA was conducted to evaluate potential risks to terrestrial ecological receptors exposed to chemicals detected in soil. The site is relatively undisturbed and provides suitable terrestrial habitat for a variety of plant, invertebrate, bird, and mammal communities.

No unacceptable risks to plants and animals and other wildlife potentially feeding on those plants and animals were identified. Detailed information is provided in the UXO 18 RI/FS Report.

5. Scope and Role of Response Action

For the purposes of satisfying its CERCLA obligations, the Navy has divided the former VNTR into 18 UXO sites. The terrestrial portion of Cayo La Chiva is designated as UXO 18 and the preferred alternative described in this Proposed Plan will address explosive hazards to ensure UXO 18 can be used for the planned recreational activities. The response action is intended to be the final remedy for UXO 18, and it does

not include or affect any other sites under the CERCLA process. To date, a final remedy has been selected for one other UXO site (UXO 1). In addition, an interim action is planned in 2016 for the area of UXO 16 immediately adjacent to UXO 18, but this interim action will not affect the final remedy for UXO 18.

6. Remedial Action Objectives

Remedial action objectives (RAOs) are statements that define the extent to which sites require cleanup to protect human health and/or the environment. The following RAOs were developed to be protective of current and potential future receptors, in accordance with the current and intended future land use (i.e., recreational area):

- Reduce any explosive hazard that may be present associated with MEC to be compatible with current and anticipated future land use.
- Reduce the potential for unauthorized access to the site.

What is Ecological Risk and How is it Calculated?

An Ecological Risk Assessment (ERA) is conceptually similar to a Human Health Risk Assessment except that it evaluates the potential risks and impacts to ecological receptors (plants, animals other than humans and domesticated species, habitats [such as wetlands], and communities [groups of interacting plant and animal species]). ERAs are conducted using a tiered, step-wise process (as outlined in Navy and EPA ERA policy and/or guidance) and are punctuated with Scientific Management Decision Points (SMDPs). SMDPs represent points in the ERA process where agreement among stakeholders on conclusions, actions, or methodologies is needed so that the ERA process can continue (or terminate) in a technically defensible manner. The results of the ERA at a particular SMDP are used to determine how the ERA process should proceed, for example, to the next step in the process or directly to a later step. The process continues until a final decision has been reached (i.e., remedial action if unacceptable risks are identified, or no further action if risks are acceptable). The process can also be iterative if data needs are identified at any step; the needed data are collected and the process starts again at the point appropriate to the type of data collected.

An ERA has three principal components:

1. Problem Formulation establishes the goals, scope, and focus of the ERA and includes:

- Compiling and reviewing existing information on the habitats, plants, and animals that are present on or near the site
- Identifying and evaluating area(s) where site-related chemicals may be found (source areas) and at what concentrations
- Evaluating potential movement (transport) of chemicals in the environment
- Identifying possible exposure media (soil, air, water, sediment)
- Evaluating if/how the plants and animals may be exposed (exposure pathways)
- Evaluating routes of exposure (for example, ingestion)
- Identifying specific receptors (plants and animals) that could be exposed
- Specifying how the risk will be measured (assessment and measurement endpoints) for all complete exposure pathways

2. Risk Analysis which includes:

- Exposure Estimate - An estimate of potential exposures (concentrations of chemicals in applicable media) to plants and animals (receptors). This includes direct exposures of chemicals in site media (such as soil) to lower trophic level receptors (organisms low on the food chain such as plants and insects) and upper trophic level receptors (organisms higher on the food chain such as birds and mammals. This also includes the estimated chemicals dose to upper trophic level receptors via consumption of chemicals accumulated in lower food chain organisms.
- Effects Assessment - The concentrations of chemicals at which an adverse effect may occur are determined.

3. Risk Calculation or Characterization:

- The information developed in the first two steps is used to estimate the potential risk to plants and/or animals by comparing the exposure estimates with the effects threshold.
- Also included is an evaluation of the uncertainties (that is, potential degree of error) associated with the predicted risk estimate and their effects on ERA conclusions.

The three principal components of an ERA are implemented as an 8-step, 3-tier process as follows:

1. **Screening-Level ERA (Steps 1-2; Tier 1)** – The Screening Level ERA (SLERA) conducts an assessment of ecological risk using the three steps described above and very conservative assumptions (such as using maximum chemical concentrations).
2. **Baseline ERA (Steps 3-7; Tier 2)** – If potential risks are identified in the SLERA, a Baseline ERA (BERA) is typically conducted. The BERA is a reiteration of the three steps described above but uses more site-specific and realistic exposure assumptions, as well as additional methods not included in the SLERA, such as consideration of background concentrations. The BERA may also include the collection of site-specific data (such as measuring the concentrations of chemicals in the tissues of organisms, for example, fish) to address key risk issues identified in the SLERA.
3. **Risk Management (Step 8; Tier 3)** – Step 8 develops recommendations on ways to address any unacceptable ecological risks that are identified in the BERA and may also include other activities, such as evaluating remedial alternatives.

7. Summary of Remedial Alternatives

The following four remedial alternatives were developed to address potential MEC explosive hazards:

- Alternative 1 – No Action
- Alternative 2 – Land Use Controls and MEC Inspections
- Alternative 3 – Limited MEC Removal, Land Use Controls, and MEC Inspections
- Alternative 4 – MEC Removal, Land Use Controls, and MEC Inspections

These remedial alternatives were developed and evaluated to address MEC explosive hazards at UXO 18 and are detailed in the RI/FS Report. Following the screening of various technologies, the following remedial alternatives, as summarized in Table 2 and shown in Figure 4 (Alternative 2), Figure 5 (Alternative

3), and Figure 6 (Alternative 4), were selected for detailed evaluation and comparative analysis. To support evaluation of the alternatives, PRDNER has identified and mapped locations of proposed future recreational features and public use areas, including a Landing/Picnic Area at the northern end of Cayo La Chiva, an Overlook/Picnic Area on the west coast of the island, a trail through the center of the island connecting these two areas, and an Anchorage Area to the northwest of the island. These proposed public use areas are shown in Figures 4, 5, and 6.

Inclusion of the No Action Alternative is required by the NCP as a basis of comparison for the other alternatives. Each remedial alternative for UXO 18 was evaluated with respect to the nine evaluation criteria provided in the NCP. The alternatives were then compared to one another with respect to each NCP criterion.

Table 2 – Remedial Alternatives

Alternative	Components	Details	Cost
1. No Action No action and no restriction on activities.	- N/A	- No action.	Total Present-Worth Cost: \$0
2. Land Use Controls and MEC Inspections Manages MEC explosive hazards by reducing the potential for unauthorized access to the site and by periodic inspections to identify and remove exposed MEC.	<ul style="list-style-type: none"> - Physical demarcation and institutional controls (ICs) - Long Term Monitoring (LTM) and Operations and Maintenance (O&M) 	<ul style="list-style-type: none"> - Maintaining physical demarcation and ICs (restrictive covenants) to restrict future access. This includes maintaining signage on the island itself and on Blue Beach and Punta Galintez to deter unauthorized access to the island. - Perform LTM to observe any indications of trespassing, repair any damage to signage, replace any missing or significantly damaged signage, and identify and remove any MEC that may have been exposed at the surface along potential trespassing routes observed. - Annual certification that LUCs are in place and effective. 	Capital Cost: \$586,000 Present Value of Future, Annual Operations and Maintenance (O&M) Costs: \$1,493,000 Total Present-Worth Cost: \$2,079,000 Assumed timeframe: 30 years
3. Limited MEC Removal, Land Use Controls, and MEC Inspections Manages MEC explosive hazards by removing surface and subsurface MEC to support potential future recreational activities. Additionally, the potential for unauthorized access will be reduced and periodic inspections to identify and remove exposed MEC will be implemented.	<ul style="list-style-type: none"> - Limited MEC removal - Physical demarcation and ICs - LTM and O&M 	<ul style="list-style-type: none"> - Limited MEC removal to an estimated maximum (based on near-surface bedrock) depth of 1 foot below ground surface (bgs) to support future recreational uses. MEC removal will be conducted out to 10 feet on each side of the trail centerline, which will include a vegetative buffer on both sides of the trail. - Vegetation clearance to establish a Landing/Picnic area, an Overlook/Picnic Area, and a trail linking the two, as well as to facilitate MEC removal activities. Minor pruning of vegetation will be conducted in the buffer area to maintain the vegetative cover while facilitating MEC clearance. Biological and archaeological surveys may need to be completed at UXO 18 prior to any vegetation clearance and MEC removal activities. - Restoration of excavations, where necessary. 	Capital Cost: \$1,160,000 Present Value of Future, Annual O&M Costs: \$1,930,000 Total Present-Worth Cost: \$3,090,000 Assumed timeframe: 30 years

Table 2 – Remedial Alternatives			
Alternative	Components	Details	Cost
		<ul style="list-style-type: none"> - Maintaining physical demarcation and ICs (restrictive covenants) to control future access. This includes (at a minimum) signage on the island itself to deter unauthorized access to areas of the island not intended for recreational use and guide visitors to the trails and recreational sites. The LUCs will provide the ability for planned land use and management. - Perform LTM to observe any indications of trespassing, repair any damage to signage, replace any missing or significantly damaged signage, and identify and remove any MEC that may have been exposed at the surface along potential trespassing routes observed. - Annual certification that LUCs are in place and effective 	
4. MEC Removal, Land Use Controls, and MEC Inspections Manages MEC explosive hazards by removing surface and subsurface MEC over the entire island. Additionally, the potential for unauthorized access will be reduced and periodic inspections to identify and removed exposed MEC will be implemented.	<ul style="list-style-type: none"> - MEC removal - Physical demarcation and ICs - LTM and O&M 	<ul style="list-style-type: none"> -- Surface and subsurface MEC removal to an estimated maximum depth (based on near-surface bedrock) of 1 foot bgs over the entire area of UXO 18, with the exception of the steep slopes and cliff edges (inaccessible areas). - Complete vegetation clearance of all accessible areas of the site to allow for surface and subsurface MEC removal. Biological and archaeological surveys may need to be completed at UXO 18 prior to any vegetation clearance and MEC removal activities. - Site restoration and re-vegetation of the accessible portions of the entire island. - Maintaining physical demarcation and ICs (restrictive covenants) to control future access. This includes (at a minimum) signage on the island itself to deter unauthorized access to areas of the island not intended for recreational use and guide visitors to the trails and recreational sites. The LUCs will provide the ability for planned land use and management. - Perform LTM to observe any indications of trespassing, repair any damage to signage, replace any missing or significantly damaged signage, and identify and remove any MEC that may have been exposed at the surface along potential trespassing routes observed. - Annual certification that LUCs are in place and effective. 	<p>Capital Cost: \$3,268,000</p> <p>Present Value of Future, Annual Operations and Maintenance (O&M) Costs: \$2,091,000</p> <p>Total Present-Worth Cost: \$5,359,000 Assumed timeframe: 30 years</p>

The NCP outlines the approach for comparing remedial alternatives. Evaluation of the alternatives uses nine evaluation criteria, which consist of "threshold," "primary balancing," and "modifying" criteria (Table 3). To be considered for selection as the preferred alternative, a remedial alternative must meet the two threshold criteria. The five primary balancing criteria, which are technical criteria based on environmental protection, cost, and engineering feasibility, are then considered to determine which alternative provides the best combination of attributes. Finally, upon receipt of public comments on this

Proposed Plan, the preferred alternative is evaluated further against the two modifying criteria.

The four remedial alternatives were evaluated against the first seven of the nine criteria identified in the NCP. The two remaining criteria will be considered after the public comment period for this Proposed Plan.

7.1 Relative Evaluation of Alternatives

The comparative analysis of alternatives with respect to the first seven evaluation criteria is summarized in Table 3. The UXO 18 RI/FS Report provides a more-detailed discussion of the evaluation and includes a

table that provides a relative ranking of the alternatives.

7.2 Threshold Criteria

Overall Protection of Human Health and the Environment. Alternative 1 (no action) does not achieve the RAOs. The remaining alternatives are protective of human health and the environment and reduce the exposure to MEC by controlling land use and access, limiting intrusive activities, and performing MEC removal.

Compliance with Applicable Relevant and Appropriate Requirements (ARARs). All alternatives can comply with the ARARs. A complete list of the ARARs is included in the UXO 18 RI/FS Report, comprising chemical-specific ARARs (none), location-specific ARARs (such as those that govern activity in a coastal zone), and action-specific ARARs (such as those that govern the management of munitions).

Table 3 – Evaluation Criteria for Comparative Analysis of Alternatives

CERCLA Criteria	Definition
Threshold Criteria	
Protection of human health and the environment	Addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through mitigation, engineering controls, or institutional controls.
Compliance with Applicable Relevant and Appropriate Requirements (ARARs) and "To-Be-Considered" criteria	Addresses whether a remedy will meet all of the ARARs or other Federal and Commonwealth/State environmental laws and/or justifies a waiver of the requirements.
Primary Balancing Criteria	
Long-term effectiveness and permanence	Addresses the expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up goals have been met.
Primary Balancing Criteria	
Reduction in toxicity, mobility, or volume through treatment	Discusses the anticipated performance of the treatment technologies a remedy may employ.
Short-term effectiveness	Considers the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until clean-up goals are achieved.
Implementability	Evaluates the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement an option.
Present-worth cost	Compares the estimated initial, operations and maintenance, and present-worth costs.
Modifying Criteria	
Commonwealth/State acceptance	Considers the Commonwealth/State support agency comments on the Proposed Plan.
Community acceptance	Provides the public's general response to the alternatives described in the Proposed Plan, and RI/FS report. The specific responses to the public comments are addressed in the "Responsiveness Summary" section of the ROD.

7.3 Primary Balancing Criteria

Long-Term Effectiveness and Permanence. Each of the alternatives, with the exception of Alternative 1, is expected to achieve long-term effectiveness and permanence. Previous investigations identified a low

number of scattered MEC, and it is anticipated that any remaining MEC at the site is sporadic and in less accessible areas. Alternatives 2, 3, and 4 provide long-term control assuming implementation of LUCs and an LTM program to confirm the remedy effectiveness and identify changes in site conditions. The reliability of the

control increases with the amount of area that is cleared of potential MEC, so Alternative 4 would have the highest reliability, with Alternatives 3 and 2 having somewhat less reliability (in that order). However, the entire island would be cleared of vegetation with Alternative 4, and with such a thin veneer of soil above bedrock at this site, successful re-vegetation and restoration of the island would be difficult.

Reduction in Toxicity, Mobility, or Volume through Treatment. Alternative 1 does not result in any reduction of toxicity, mobility, or volume (TMV) by treatment. Alternative 2 would result in reduction of TMV by MEC removal and subsequent destruction, if MEC is identified during future site inspections. Alternative 3 would result in additional TMV reduction through removal and destruction of MEC found during construction of trails and other recreational facilities on the island, in addition to MEC found during future site inspections. Alternative 4 provides the most TMV reduction through the removal and destruction of MEC (down to an estimated maximum depth of 1 foot bgs) from the accessible areas of the entire site and through future site inspections. However, exposing the soil through vegetation clearance enhances erosion and may actually increase mobility of any subsurface MEC.

Short-Term Effectiveness. *Alternative 1 would not meet short-term-effectiveness goals.* Alternative 2 can be implemented immediately after a **Record of Decision (ROD)** and remedial action work plan are finalized because it is mostly administrative. Alternatives 3 and 4 will achieve the RAOs within approximately 7 to 9 months due to the increased field effort required.

As part of the short-term effectiveness evaluation, a sustainability analysis was conducted for each of the four remedial alternatives. Sustainability is focused on energy conservation, reduction of greenhouse gases, waste minimization, and re-use and recycling of materials. Alternative 1 has no short-term construction

impacts and the lowest environmental footprint since there would be no remedial construction activities. The other alternatives would include construction activities with varying levels of potential impacts to construction workers, the community, and the environment. The amount of impact is proportional to the amount of vegetation clearance, number of MEC excavations and detonations, and truck traffic through the community. Alternative 2 has limited impacts to the landscape due to minimal vegetation clearing for boundary demarcation. Alternative 3 has some temporary disturbance of land due to the clearing required for the proposed recreational areas.

Alternative 4 has significant temporary disturbance of land during construction activities (i.e., significant vegetation clearance, MEC clearance, erosion control, and re-vegetation). Alternative 4 has the highest greenhouse gas emissions. In addition, Alternative 4 has the highest safety hazard for construction workers due to the significantly higher potential to be in contact with MEC.

Implementability. Alternative 1 would not obtain administrative approval since it does not meet the RAOs. Alternative 2 is the most implementable because it is technically and administratively feasible, and the services, equipment, and materials required are readily available. Alternative 3 is also implementable although not as easily as Alternative 2. It is technically and administratively feasible, and the services, equipment, and materials required are readily available. Alternative 4 would be the most complex alternative to implement because of much larger scale of vegetation removal and subsurface MEC clearance, compared to Alternative 3. Alternative 4 would not be implementable without vegetation clearance. Alternative 4 is expected to be impacted by a cultural resource (archaeological site) identified on site. However, Alternative 3 can be implemented while avoiding the cultural resources.

Figure 4 – Conceptual Layout of Alternative 2 – Land Use Controls and MEC Inspections

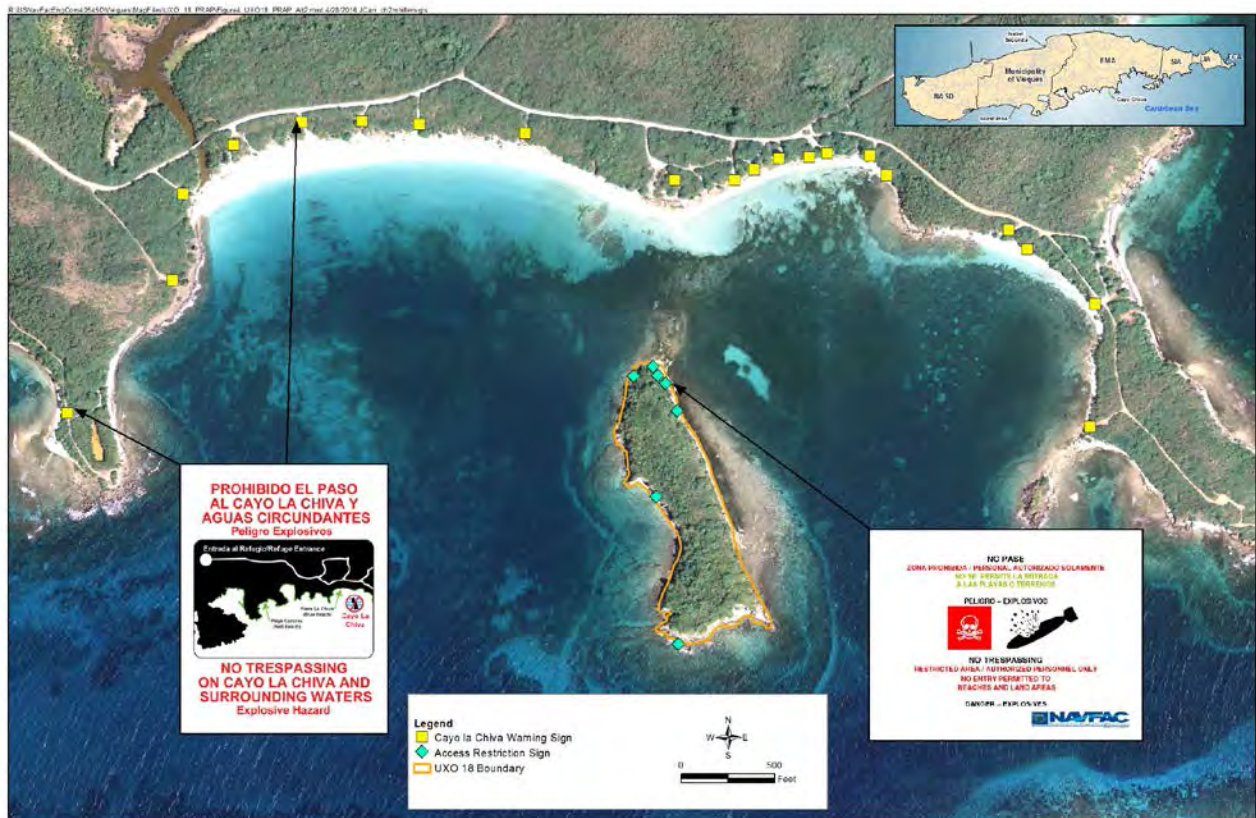


Figure 5 – Conceptual Layout of Alternative 3 – Limited MEC Removal, LUCs, and MEC Inspections

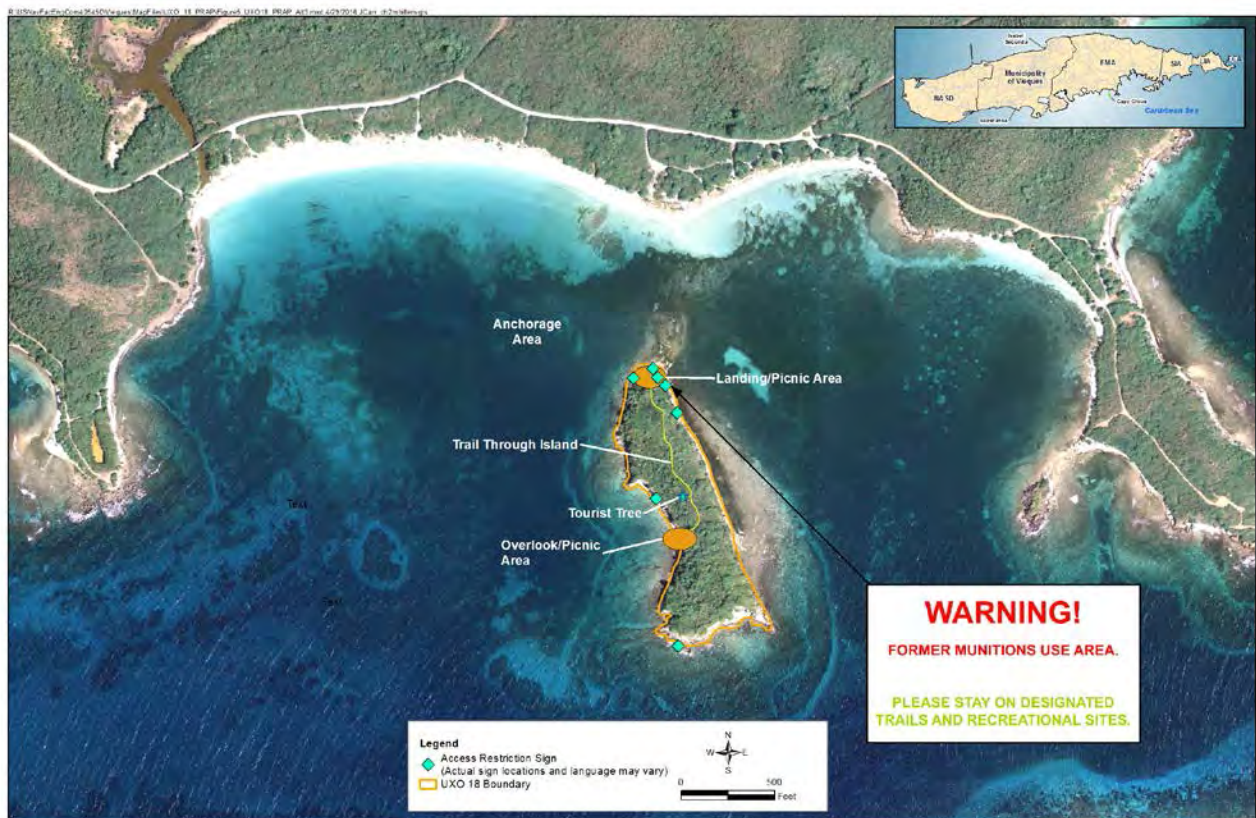
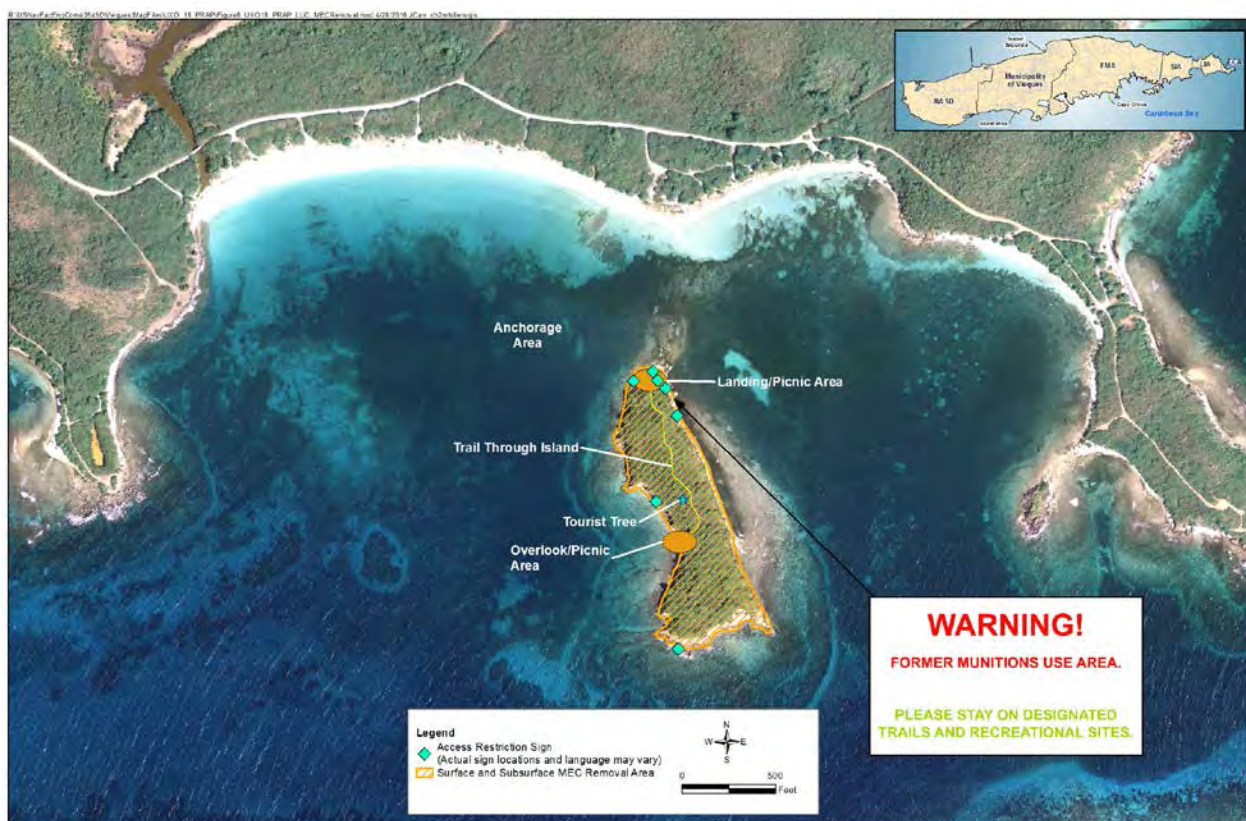


Figure 6 – Conceptual Layout of Alternative 4 – MEC Removal, LUCs, and MEC Inspections



Cost. Alternative 1 is the most cost effective, but does not meet the RAOs. Alternative 2 meets the RAOs and has a present-worth cost of \$2,079,000. Alternatives 3 and 4 both meet the RAOs and have present-worth costs of \$3,090,000 and \$5,359,000, respectively.

7.4 Modifying Criteria

Commonwealth Acceptance. Commonwealth involvement has been continual throughout the CERCLA process for UXO 18 and PREQB and PRDNER supports the preferred alternative. However, PREQB's and PRDNER's formal concurrence is pending following the review of all comments received during the public comment period.

Community Acceptance. Community acceptance will be evaluated after the public comment period for the Proposed Plan, and substantive public comments will be documented and addressed in the forthcoming Record of Decision for UXO 18.

8. Preferred Alternative

The Navy and EPA, in consultation with PREQB and PRDNER, have identified Alternative 3 - Limited MEC Removal, Land Use Controls, and MEC Inspections

as the preferred alternative for UXO 18. Based on the evaluation of the data, information currently available, and the comparative analysis, the preferred alternative meets the statutory requirements of CERCLA for protection of human health and the environment under current and projected future land use as a recreational area.

Key elements that make Alternative 3 the preferred alternative are:

- MEC removal and vegetation removal from areas that are identified by the PRDNER for future recreational use (e.g., trails and observation tower).
- Site and vegetation restoration as needed after MEC removal and trail creation.
- Ecological habitat is preserved.
- LUCs and associated MEC/MD monitoring and removal of MEC items (if any) identified during routine inspections will reduce potential exposure to MEC.

9. Community Participation

A community relations program has been ongoing for the Vieques environmental restoration program since 2001. The community relations program fosters two-way communication of investigation and remediation activities between the stakeholder agencies (Navy, EPA, PREQB, USFWS, and PRDNER) and the public. A Restoration Advisory Board was formed in 2004 to provide for expanded community participation. Regular meetings are held to provide an information exchange among community members, stakeholder agencies, and the Municipality of Vieques. These meetings are open to the public and are held approximately every 3 months.

Public input is a key element in the decision-making process. Nearby residents and other interested parties are strongly encouraged to use the comment period to relay any questions and comments about the preferred alternative for UXO 18. Following the public comment period, the Navy and EPA will summarize and respond to substantive comments in a Responsiveness Summary, which will become part of the official ROD for UXO 18.

This Proposed Plan fulfills the public participation requirements of CERCLA Section 117(a), which specifies that the lead agency (the Navy) must publish a plan outlining any remedial alternatives evaluated for a site and identify the preferred alternative. The Community Involvement Plan and technical reports supporting the preferred alternative for UXO 18 are available for public review in the Administrative Record at: <http://www.navfac.navy.mil/vieques>. Additionally, paper copies of the UXO 18 Proposed Plan are available at the EPA office in Vieques.

The public comment period for the Proposed Plan provides an opportunity for input regarding the remedy selection process for UXO 18. The public comment period will be from July 11 to August 25, 2016, and a public meeting will be held on August 2, 2016, 6:00 – 7:00 PM at the Punta Mulas Lighthouse, Route #200, Morropo Street, Isabel Segunda, Vieques, Puerto Rico. All interested parties are encouraged to attend the public meeting to learn more about the preferred alternative for UXO 18. The meeting will provide an additional opportunity to submit comments on the Proposed Plan.

Comments on the preferred alternative, or this Proposed Plan, must be postmarked no later than August 25, 2016. On the basis of comments or new information, the Navy and EPA, in consultation with

PREQB and PRDNER, may modify the preferred alternative or choose another alternative. The comment page included as part of this Proposed Plan may be used to provide comments to the Navy. However, questions or comments can be submitted to any of the individuals listed in the box below during the public comment period.

Note: This Proposed Plan is presented in English and Spanish for the convenience of the reader. Every effort has been made for the translations to be as accurate as reasonably possible. However, readers should be aware that the English version of the Proposed Plan is the official version.

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10. Glossary

Acceptable Risk: EPA's acceptable risk range for Superfund hazardous waste sites is 1×10^{-4} to 1×10^{-6} , meaning there is 1 additional chance in 10,000 (1×10^{-4}) to 1 additional chance in 1 million (1×10^{-6}) that a person will develop cancer if exposed to contaminants at a site that is not remediated.

Accessible Areas: Areas of the site people could easily reach once at the site (i.e., does not include steep slopes or cliffs).

Administrative Record: A compilation of documents and information for CERCLA sites that is made available to the public for review.

Applicable or Relevant and Appropriate Requirements (ARARs): CERCLA Section 121 (d)(2)(A) requires that remedial actions meet any federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate.

Background Concentration: Concentrations of naturally occurring and anthropogenic (due to human activities) constituents, such as inorganic constituents, found in groundwater, soil, sediment, and surface water at levels not influenced by site-specific releases. Background concentrations of some inorganics and other constituents are often at levels that may pose a risk to human health or the environment. However, background concentrations of site chemicals are factored into risk management determinations to ensure remedial actions are not implemented for constituents whose concentrations are attributable to background conditions and not indicative of a site-related release.

Cancer Risk: Cancer risks are expressed as a number reflecting the increased chance that a person will develop cancer if exposed to chemicals or substances, as described in the Human Health Risk Assessment.

Chemical of Potential Concern (COPC): A chemical at the site that may be hazardous to human health or the environment due to its detected concentrations.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA): A Federal law passed in 1980 (United States Code Title 42, Chapter 103), commonly referred to as the "Superfund" Program, that provides for cleanup and emergency response in connection with numerous existing, inactive hazardous substance disposal sites that endanger public health and safety or the

environment. CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) in 1986.

Department of the Interior (DOI): Land owner of the National Wildlife Refuge.

Ecological Risk Assessment (ERA): An evaluation of the risk posed to ecological receptors (i.e., plants and animals) if remedial activities are not performed at the site.

Environmental Protection Agency (EPA): The Federal agency responsible for administration and enforcement of CERCLA (and other Federal environmental statutes and regulations).

Excess Lifetime Cancer Risk (ELCR): Potential carcinogenic effects that are characterized by estimating the probability of cancer incidence in a population of individuals for a specific lifetime from projected intakes (and exposures) and chemical-specific dose-response data.

Feasibility Study (FS): A study undertaken by the lead agency to develop and evaluate options for remedial action. The FS emphasizes data analysis and is generally performed concurrently with the RI. The data from the RI is used to define the objectives of the response action, to develop remedial action alternatives, and to undertake an initial screening and detailed analysis of the alternatives.

Groundwater: The supply of water beneath the Earth's surface that occurs in the pore spaces between soil grains or within fractures in geologic formations that are fully saturated.

Hazard Index (HI): The HI represents a measure of the potential for non-carcinogenic effects from exposure to COPCs. A "threshold level" (measured as an HI of 1) exists below which no non-cancer health effects are expected to occur.

Human Health Risk Assessment (HHRA): A qualitative and quantitative evaluation of the risk posed to human health by the presence of specific pollutants. Elements include: identification of the hazardous substances present in the environmental media; assessment of exposure and exposure pathways; assessment of the toxicity of the site's hazardous substances; and characterization of human health risks.

Land Use Control (LUC): Physical, legal, or administrative methods that restrict the use of or limits access to property to reduce risks to human health and the environment.

Media (singular, Medium): Soil, groundwater, surface water, or sediment at the site.

Munitions and Explosives of Concern (MEC): Distinguishes specific categories of military munitions that may pose unique explosive risks.

Munitions Debris (MD): Non-explosive remnants of munitions remaining after munitions use, demilitarization, or disposal.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The Federal regulations (Code of Federal Regulations [CFR], Volume 40, Part 300 [40 CFR 300]) that guide determination of the sites to be corrected under both the Superfund (CERCLA) program and the program to prevent or control spills into surface waters or elsewhere.

National Priorities List (NPL): A list developed by EPA of uncontrolled hazardous substance release sites in the United States that are considered priorities for long-term remedial evaluation and response.

Non-Cancer Hazard: Non-cancer hazards (or risk) are expressed as a quotient that compares the potential exposure to contaminants at a particular site to the acceptable level of exposure. There is a level of exposure (the reference dose) below which it is unlikely for even a sensitive population to experience adverse health effects. EPA's threshold level for non-cancer risk at Superfund sites is 1, meaning that if the exposure at a particular site exceeds the threshold, there may be a concern for potential non-cancer effects.

Non-Time-Critical Removal Action (NTCRA): A removal action conducted to address priority risks when a planning period of at least six months is available.

Preferred Alternative: With respect to the nine criteria specified in the NCP for evaluating remedial alternatives, the Preferred Alternative is the proposed remedy that meets the threshold criteria and is deemed to provide the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria.

Present-Worth Cost: Total present day cost to complete the proposed remedy.

Proposed Plan: A document that presents the preferred remedial alternative and requests public input regarding its proposed selection.

Public Comment Period: The time allowed for the members of a potentially affected community to express views and concerns regarding an action proposed to be taken at a site, such as a rulemaking, permit, or remedy selection.

Puerto Rico Department of Natural and Environmental Resources (PRDNER): The agency responsible for protecting natural resources, Commonwealth-owned conservation areas, submerged lands, and the coastal zone in the Commonwealth of Puerto Rico.

Puerto Rico Environmental Quality Board (PREQB): The agency responsible for protecting the quality of the environment of Puerto Rico through prevention and contamination control of: air, water, soil, and noise pollution.

Receptors: Humans, animals, or plants that may be exposed to contaminants related to a given site.

Record of Decision (ROD): A legal document that describes the cleanup action or remedy selected for a site, the basis for choosing that remedy, and reflects the public comments that were considered regarding the selected remedy.

Remedial Action Objectives (RAOs): Statements that define the extent to which sites require cleanup to protect human health and the environment.

Remedial Investigation (RI): A study in support of the selection of a remedy at a site where hazardous substances have been released. The RI identifies the nature and extent of contamination and assesses human health and ecological risk associated with the contamination.

Soil Screening Level (SSL): A screening criterion designed to evaluate the potential for chemicals to leach from soil to groundwater and to be protective of exposures in a residential setting.

Unacceptable Risk: Excess lifetime cancer risk that exceeds EPA's acceptable risk range for Superfund hazardous waste sites of 1×10^{-4} to 1×10^{-6} or a non-cancer hazard in excess of EPA's target level of 1.

United States Fish and Wildlife Service (USFWS): The Federal agency responsible for the management of the Department of the Interior-owned land and the protection of trust species (e.g., threatened and endangered species and migratory birds) on Vieques.

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Place
stamp
here

NAVFAC Atlantic
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